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Portable Timber Bridges: An Eco-friendly Solution for Stream Crossings



USDA Forest Service



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Preface

This publication was developed to document an effort that began in West Virginia in 1989. This effort started as a USDA Forest Service, Northeastern Area/West Virginia Division of Forestry "Rural Development through Forestry" project. The goal of the project was to design and build several experimental portable timber bridges that are relatively easy to manufacture, transport, and install. They are used for temporary access during harvesting operations. From the beginning of the project, three different designs were developed and tested at West Virginia University. The three designs are based on stress-laminated technology.

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Cover Photo: This portable timber bridge offers temporary and safe access to the logging site. Courtesy of Coastal Lumber Company.

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Portable Timber Bridges: an Eco-friendly Solution for Stream Crossings

Introduction

Worldwide demand for wood continues to increase as population increases. In 1995, for every one death there were three births. The Gross Domestic Product of thriving third world countries ranged from 4 to 8 percent. These types of statistics indicate there is greater pressure on our forest resources to provide wood products for the world's increasing standard of living.

For example, in the United States, as the repair and remodeling market continues to grow, the demand for wood products increases. At the same time, woodland managers are being asked to maintain forests for other uses, such as recreation, aesthetics, clean water, and fresh air. Therefore, as the Nation struggles to meet its growing need for wood products, it must do so in an eco-friendly manner.



A fully-loaded truck crosses a stream with no negative impacts to the stream environment. Courtesy of Coastal Lumber Company.

An opportunity exists for the forestry community to minimize erosion and sedimentation during timber harvesting. This can be done by using portable timber bridges for stream crossings.

Portable timber bridges enable quick, safe, temporary access to a logging operation. They can be cost-effective, relatively easy to install, environmentally sound, and reusable.

Federal, state, and private interests are aware that logging activities can adversely affect the environment, especially the water quality of an area. To alleviate environmental degradation, many states have developed Best Management Practices (BMPs) for harvesting operations.

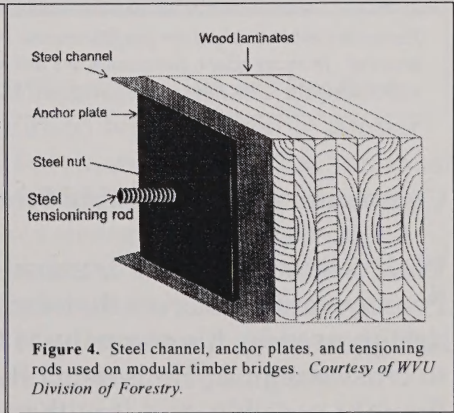
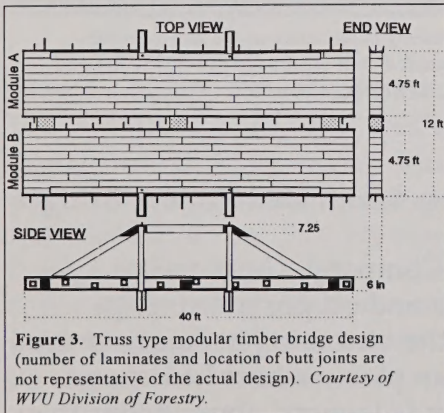
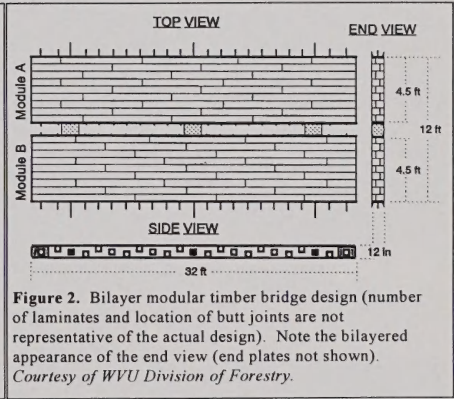
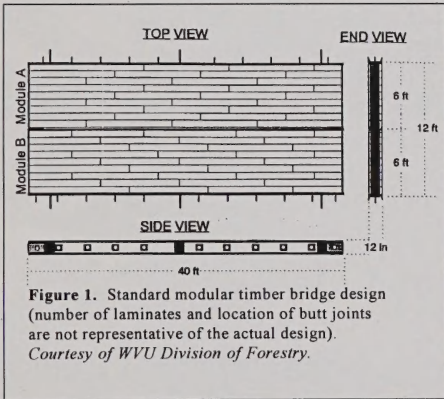
The Environmental Protection Agency (EPA) recommended BMPs in Section 208 of the 1978 Clean Water Act. BMPs are guidelines determined by individual states or regional planning groups that are intended to prevent or reduce pollution caused by nonpoint sources in forestry activities. Originally, compliance with BMPs was voluntary; however, in many states their implementation has become mandatory. Loggers can follow these recommendations without undue hardship. Most erosion and sediment introduction during logging operations occurs at streams and stream crossings. Use of temporary structures for stream crossings can alleviate this problem. Portable timber bridges are sound investments that allow loggers to cross streams without impairing water quality.

Background

In 1989, the West Virginia Division of Forestry, located in Charleston, West Virginia, and the USDA Forest Service developed a partnership with the Appalachian Hardwood Center (AHC) and the Division of Forestry (DOF), both located at West Virginia University (WVU) in Morgantown, West Virginia. The purpose of the partnership was to develop and demonstrate a simple, dependable, and economical portable timber bridge design used for timber harvesting operations. The researchers designed, constructed, and demonstrated three portable timber bridges.

The three types of bridges designed, constructed, and tested are illustrated in Figures 1-3. These bridges consist of two modules that are joined side-by-side during installation. Each module is manufactured from lumber that is laminated on edge with threaded steel rods (Figure 4).

The first bridge tested was a simple longitudinally stress-laminated timber (Figure 1) bridge that was designed, constructed, installed, and evaluated at the WVU Forest. Using common logging and construction equipment, workers installed the bridge with very little site preparation and no abutments. The bridge was simply placed on the existing stream bank after minor grading. Curt Hassler, leader of the AHC, believes these bridges are the best alternative for minimizing environmental degradation at a reasonable cost.



Coastal Lumber Company, a domestic and international forest products company, assisted West Virginia University in 1989 by donating the treatment for the lumber of a stress-laminated demonstration bridge. Not long afterwards, Coastal began working with the concept of developing a portable timber bridge that would enable them to perform timber sales without adversely affecting water quality. They have perfected a stress-laminated design and are in the process of obtaining patent rights. Since working with WVU, Coastal has manufactured and utilized four bridges on different logging operations. Although these bridges are for their own use, Coastal is manufacturing and marketing similar bridges to other firms involved in harvesting operations.



Portable timber bridges are prefabricated, making installation at the site a simple process. In many cases, abutments are not needed, and the bridge can be placed and utilized within a few hours. Courtesy of Coastal Lumber Company.

Comments About Portable Stress-Laminated Timber Bridges

Walt Graham, Coastal Lumber Company, Uniontown, Pennsylvania, believes that the standard portable bridge design used by his company is the best thing he has ever used to cross streams. He is using it in places where he never thought possible, and it withstands loggers' abuse better than

he anticipated. The portable bridge enables him to place the landing closer to the harvest site. After using the bridge eight times in a year and a half, it has already paid for itself.

Jan Edwards, USDA Forest Service - Cherokee National Forest, Tennessee, is working with a three-span bridge, which is 70 feet long. A permanent bridge would have cost \$150,000, as compared to the \$20,000 that was spent on the portable timber bridge. Mr. Edwards was able to save money and at the same time protect the stream. He feels that the bridge “serves its purpose very well.”



This portable timber bridge in the Cherokee National Forest is saving the U.S. Forest Service money and protecting the stream from sedimentation. Courtesy of Jan Edwards, USDA Forest Service.

John Foreman, Vice President of Resources, Wood Products, Inc., Oakland, Maryland, has worked with a portable timber bridge designed by WVU. Mr. Foreman believes that the most important benefit the bridge provides is access to previously inaccessible areas. Mr. Foreman’s overall impression of the bridge is that “it is a bit cumbersome to handle; however, the trade-off of being able to work in sensitive areas [without negative impacts] is worth it.” Mr. Foreman recommends that an expert help with the first installation, including site

preparation. The portable bridge used in this situation was a prototype that did not include several of the features found in recently designed bridges that ease installation.

Don Kyle, USDA Forest Service - Jefferson National Forest, Virginia, is working with a 40-foot timber bridge. Before obtaining the bridge, Mr. Kyle used a structure similar to a ford, which cost about \$9,000. The bridge, abutments, and installation cost of the portable bridge was \$18,000, but it can be re-used — often without abutments. Mr. Kyle reports that the bridge works very well and timber purchasers accept them. He said that, “[the bridges] are a very good way to span a stream, they almost eliminate sedimentation.”



This portable timber bridge is being utilized on the Jefferson National Forest. Since these bridges can be reused, it may be moved from one place to another within the Forest. Courtesy of Don Kyle, USDA Forest Service.

Ron Phillips, owner of 92 Logging, Belington, West Virginia, worked with another timber bridge designed by WVU. Mr. Phillips was “duly impressed” and believes portable bridges are a worthwhile investment. Mr. Phillips noticed that there was less sedimentation in the stream, and the bridge eliminated the cost of culverts and permanent bridges. The stream crossing that Mr. Phillips used the bridge for required abutments. The placement of the abutments caused temporary siltation, but the overall impact on the stream was minimal.



Portable timber bridges are a wise investment. They are cost-effective, and they keep sediment out of streams. Courtesy of Coastal Lumber Company.

Benefits of Portable Bridges

In the past, fords, culverts, and permanent bridges primarily have been used to cross forest streams. However, these methods have the potential to create soil erosion and sedimentation problems, or are extremely expensive. For example, fords allow sediment into streams when vehicles drive over them, and installation and

removal of culverts introduce sediment into waterways. Permanent bridges are problematic because they open up the property indefinitely and are an unnecessary expense.

Portable timber bridges, on the other hand, provide many benefits. They are kind to the environment because they:

- Minimize stream siltation,
- Meet or exceed most BMP guidelines,
- Keep wood and other debris out of waterways,
- Are reusable,
- Minimize erosion, and
- Keep streams clear of debris after installation.

Portable timber bridges are economical because they are:

- Reusable — after four or five sites the bridge has paid for itself,
- Inexpensive to install,
- Often manufactured from locally available timber, and
- Minimal in cost compared to the timber sale.

Portable timber bridges are a wise choice because they:

- Take less than a day to install, sometimes just a couple of hours,
- Eliminate access to property after harvesting is completed,
- Are easy to transport,
- Are easy to fabricate, or can be purchased prefabricated, and
- Require little maintenance.

In conclusion, portable timber bridges allow loggers to harvest timber while following BMPs. The initial cost for these bridges is an investment that will pay for itself. Many forest products companies have seen a need for these temporary bridges in their operations. Clearly, these bridges can be a cost-effective way to protect the environment.

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